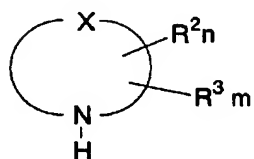


CLAIMS

1. A process for producing a nitrogenous heterocyclic compound defined by the general formula (3):

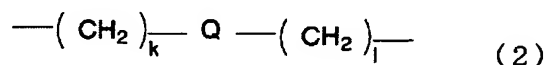
[Chem. 3]



(3)

wherein R^2 and R^3 independently denote i) a hydrogen atom; ii) a lower alkyl having 1 to 4 carbon atoms; iii) a lower alkoxy having 1 to 4 carbon atoms; iv) a hydroxyl group; v) a mercapto group; vi) an (un)substituted amino group; vii) an aryl whose aromatic ring may be unsubstituted or substituted with an alkyl having 1 to 4 carbon atoms, an alkoxy having 1 to 4 carbon atoms, or a halogen atom; or viii) an aralkyl whose aromatic ring may be unsubstituted or substituted with an alkyl having 1 to 4 carbon atoms, an alkoxy having 1 to 4 carbon atoms, or a halogen atom and may be the same or different groups; m and n independently denote an integer of 0 to 3; and X denotes a residual group of a nitrogenous heterocyclic ring defined by the general formula (2):

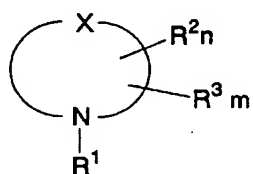
[Chem. 2]



wherein Q denotes CH_2 , NR^4 , or O, wherein R^4 denotes i) a hydrogen atom; ii) a lower alkyl having 1 to 4 carbon atoms; iii) a lower alkoxy having 1 to 4 carbon atoms; iv) an aryl whose aromatic ring may be unsubstituted or substituted with an alkyl having 1 to 4 carbon atoms, an alkoxy having 1 to 4 carbon atoms, or a halogen atom; v) an aralkyl whose aromatic ring may be unsubstituted or substituted with an alkyl having 1 to 4 carbon atoms, an alkoxy having 1 to 4 carbon atoms, or a halogen atom;

or vi) an aralkyloxy whose aromatic ring may be unsubstituted or substituted with an alkyl having 1 to 4 carbon atoms, an alkoxy having 1 to 4 carbon atoms, or a halogen atom; k and l independently denote an integer of 1 to 4; and k + l is 3 to 6: by carrying out hydrogenolysis of an N-substituted nitrogenous heterocyclic compound defined by the general formula (1):

[Chem. 1]



(1)

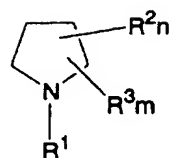
wherein R¹ denotes an (un)substituted benzyl group; R², R³, X, m, and n are the same as described: with normal pressure hydrogen in the presence of a catalyst.

2. The process for producing the nitrogenous heterocyclic compound according to claim 1, wherein the catalyst is Pd.

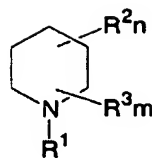
3. The process for producing the nitrogenous heterocyclic compound according to claim 1 or 2, wherein the hydrogenolysis is carried out in a water-based solvent.

4. The process for producing the nitrogenous heterocyclic compound according to any one of claims 1 to 3, wherein the N-substituted nitrogenous heterocyclic compound defined by the general formula (1) is one of a N-substituted nitrogenous heterocyclic compound defined by the following general formulas (4) to (7):

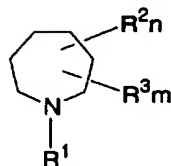
[Chem. 4]



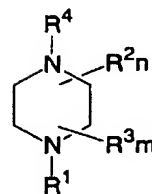
(4)



(5)



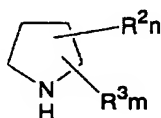
(6)



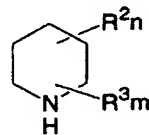
(7)

wherein R^1 , R^2 , R^3 , R^4 , m , and n are the same as described: and the nitrogenous heterocyclic compound defined by the general formula (3) is a nitrogenous heterocyclic compound defined by the following general formulas (8) to (11):

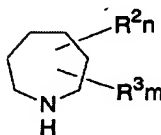
[Chem. 5]



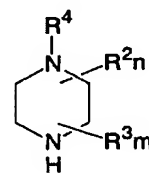
(8)



(9)



(10)



(11)

wherein R^2 , R^3 , R^4 , m , and n are the same as described.

5. The process for producing the nitrogenous heterocyclic compound according to claim 4, wherein R^2 , R^3 , and R^4 independently denote a group selected from a hydrogen atom, methyl, aminomethyl, hydroxymethyl, ethyl, hydroxyl, amino, methylamino, benzylamino, ethoxycarbonylamino, tert-butoxycarbonylamino, benzyloxycarbonylamino, methoxy,

and benzyl in the general formulas (4) to (11).

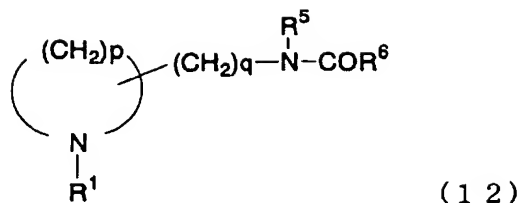
6. The process for producing the nitrogenous heterocyclic compound according to claim 4, wherein the N-substituted nitrogenous heterocyclic compound defined by the general formulas (4) to (7) is a compound selected from

3-amino-1-benzylpyrrolidine,
3-amino-1-(4-methylbenzyl)pyrrolidine,
3-methylamino-1-benzylpyrrolidine,
1-benzyl-3-tert-butoxycarbonylaminopyrrolidine,
3-benzylamino-1-benzylpyrrolidine,
1-benzyl-3-hydroxypyrrrolidine,
1-benzyl-3-methoxypyrrrolidine,
3-amino-1-benzyl-4-hydroxypyrrrolidine,
3-benzylamino-1-benzyl-4-hydroxypyrrrolidine,
2-aminomethyl-1-benzylpyrrolidine,
2-hydroxymethyl-1-benzylpyrrolidine,
3-ethoxycarbonylamino-1-(4-methylbenzyl)pyrrolidine,
1-benzyl-3-benzyloxycarbonylaminopyrrolidine,
3-amino-1-benzylpiperidine, 1-benzyl-3-methylpiperidine,
3-amino-1-benzylhexamethyleneimine,
1-benzyl-3-methylpiperazine, and
1,4-dibenzyl-3-methylpiperazine.

7. The process for producing the nitrogenous heterocyclic compound according to any one of claims 1 to 6, wherein the N-substituted nitrogenous heterocyclic compound defined by any one of the general formulas (1) and (4) to (7) is an optically active compound and the nitrogenous heterocyclic compound defined by any one of the general formulas (3) and (8) to (11) is an optically active compound.

8. The process for producing the nitrogenous heterocyclic compound according to any one of claims 1 to 3, wherein the N-substituted nitrogenous heterocyclic compound defined by the general formula (1) is a compound defined by the general formula (12):

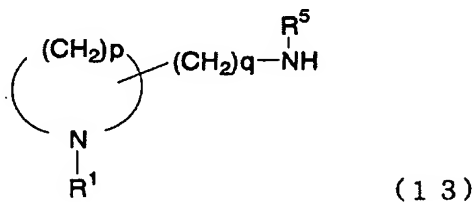
[Chem. 6]



wherein R^1 denotes an (un)substituted benzyl group; R^5 denotes a hydrogen atom or an alkyl having 1 to 4 carbon atoms; R^6 denotes i) an alkyl having 1 to 4 carbon atoms; ii) an alkoxy having 1 to 4 carbon atoms; iii) phenyl; iv) phenyloxy; v) an aralkyl whose aromatic ring may be unsubstituted or substituted with an alkyl having 1 to 4 carbon atoms, an alkoxy having 1 to 4 carbon atoms, or a halogen atom; or vi) an aralkyloxy whose aromatic ring may be unsubstituted or substituted with an alkyl having 1 to 4 carbon atoms, an alkoxy having 1 to 4 carbon atoms, or a halogen atom; q denotes 0 or 1; and p denotes an integer of 3 to 6.

9. The process for producing the nitrogenous heterocyclic compound according to claim 8, wherein the N-substituted nitrogenous heterocyclic compound defined by the general formula (12) is a compound obtained by reaction of an N-substituted nitrogenous heterocyclic compound defined by the general formula (13):

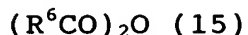
[Chem. 7]



wherein R^1 , R^5 , p , and q independently denote as described above with an acid halide compound or an acid anhydride.

10. The process for producing the nitrogenous heterocyclic compound according to claim 9, wherein the acid halide compound

or the acid anhydride is defined by the general formula (14) or (15):



wherein R^6 denotes as described above and Y denotes a chlorine atom or a bromine atom.

11. The process for producing the nitrogenous heterocyclic compound according to claim 9 or 10, wherein the reaction is carried out while pH is controlled to be in a range of 9 to 13.

12. The process for producing the nitrogenous heterocyclic compound according to any one of claims 9 to 11, wherein the reaction is carried out in a water-based solvent.

13. The process for producing the nitrogenous heterocyclic compound according to any one of claims 9 to 12, wherein the reaction is carried out in co-presence of a surfactant.

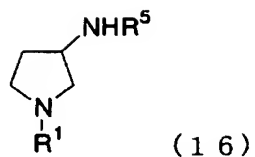
14. The process for producing the nitrogenous heterocyclic compound according to any one of claims 9 to 13, wherein the acid anhydride defined by the general formula (15) is di-tert-butyl dicarbonate.

15. The process for producing the nitrogenous heterocyclic compound according to claim 13 or 14, wherein the surfactant is an alkyl ether sulfonic acid salt or a quaternary ammonium salt.

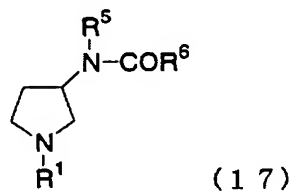
16. The process for producing the nitrogenous heterocyclic compound according to any one of claims 8 to 15, wherein the N-substituted nitrogenous heterocyclic compound defined by the general formula (13) is an optically active compound and the nitrogenous heterocyclic compound defined by the general formula (12) is also an optically active compound.

17. The process for producing the nitrogenous heterocyclic compound according to any one of claims 8 to 16, wherein the 1-substituted nitrogenous heterocyclic compound defined by the general formula (13) is a 1-substituted-3-aminopyrrolidine derivative defined by a general formula (16):

[Chem. 8]



wherein R^1 and R^5 independently denote as described above and the nitrogenous heterocyclic compound defined by the general formula (12) is a 3-substituted-aminopyrrolidine compound defined by the general formula (17):
[Chem. 9]



wherein R^1 , R^5 , and R^6 independently denote as described above.